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Integrating Semantic-Web Ontology for Ethical Robot Tasking and Simulation using Autonomous Vehicle Command Language (AVCL)

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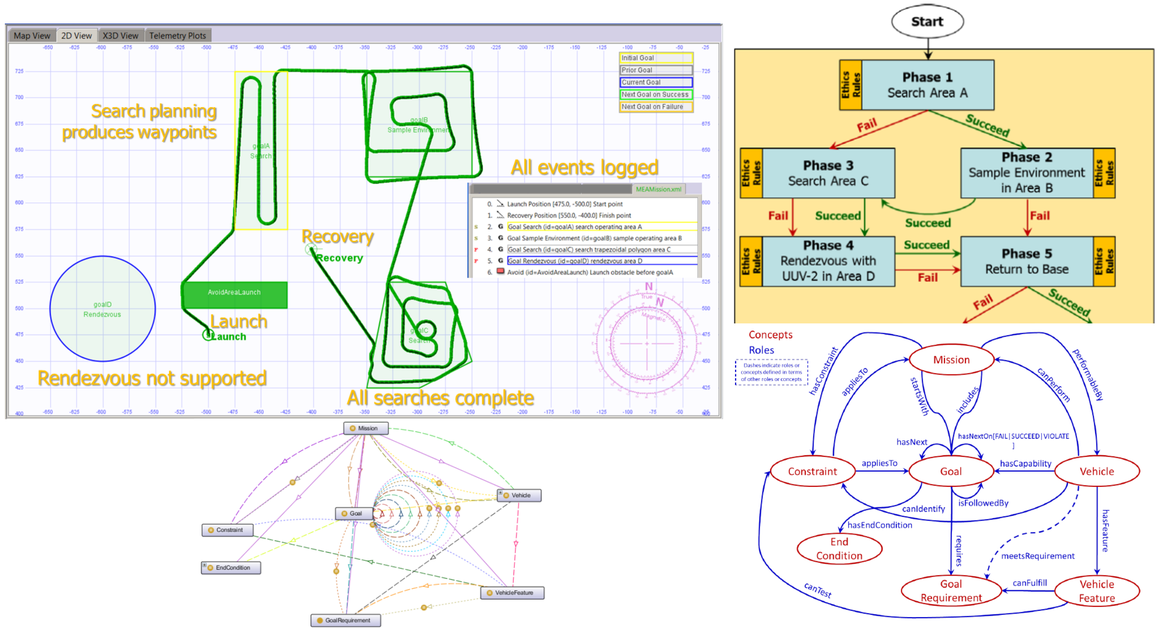

Autonomous Vehicle Mission Plan with Identified Ethical Constraints and Ontology Representation

How (Approach and Methodology)

- Prior CRUSER research work showed ethics can be applied to mission tasking as a set of logical constraints on mission tasks rather than ill-defined abstractions or opaque software builds
- Current CRUSER work is building Semantic Web constructs for robot mission planning at level of task orders, operational plans, rules of engagement (ROE) and rules of operation
- AVCL is able to express diverse robot mission tasks and plans consistently, coherently for diverse UAV, USV, UUV platforms
- These vocabularies need to be integrated and implemented in Autonomous Unmanned Vehicle Workbench (AUVW)
- Technology Readiness Level (TRL) 4-5: component validation, visualization in simulation environment suitable for field testing

What (Motivation and Background)

- *Full title:* Integrating Semantic-Web Ontology for Ethical Robot Tasking using Autonomous Vehicle Command Language (AVCL) to Create a Mission Test Suite using Autonomous Unmanned Vehicle Workbench (AUVW) Simulation
- Unmanned systems must be trusted to behave ethically and comprehensibly if they are to support manned military units
- Four years of recent work have shown steady progress on difficult, critical problems by mapping real-world exemplars
- Current theoretical progress needs thorough implementation for testing and evaluation of representative scenarios
- https://savage.nps.edu/AuvWorkbench/documentation/papers/ethics.html

Why (Operational Impact)

- **Demonstrate that ethical operation of unmanned systems is feasible**
- Integrated ontology and knowledge representations for robot mission goal definition, tasking, planning and execution
- Open-source software updates for testing and visualizing missions demonstrating application of ethical constraints
- Validation testing performed through high-fidelity simulation visualization and replay, eventually suitable for actual robots
- Student projects with corresponding mission analyst reports uploaded/ archived into growing corpus of exemplars
- Student thesis demonstrating military challenges, broad significance
- Continued series of technical reports and conference papers https://savage.nps.edu/AuvWorkbench

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